

What is claimed is:

1. A method of chemical mechanical polishing, comprising:

5 placing a substrate against a substrate receiving surface of a flexible membrane of a carrier head, the carrier head including a plurality of independently controllable chambers, each chamber associated with a different one of a plurality of portions of the substrate receiving surface of the flexible membrane to control a pressure applied by an associated portion;

10 polishing the substrate by holding the substrate against a polishing surface that is moving relative to the substrate;

during a first period of time of polishing, applying a common first pressure to each chamber so as to apply the same pressure at each portion of the substrate receiving surface;

15 after the first period of time of polishing, reducing a pressure of at least one of the plurality of chambers while continuing to apply the first pressure to a remainder of the plurality of chambers.

2. The method of claim 1, wherein reducing the pressure includes halting application of positive pressure to the at least one of the plurality of chambers.

20 3. The method of claim 1, wherein the pressures applied to the plurality of chambers are controlled by software.

4. The method of claim 1, further comprising after a second period of time of polishing, reducing a pressure of the remainder of the plurality of chambers.

25 5. The method of claim 4, further comprising selecting the first period of time and second period of time to provide uniform polishing of the substrate.

30 6. The method of claim 1, wherein the plurality of portions includes an inner portion associated with a first chamber, a substantially annular middle portion surrounding

the inner portion and associated with the second chamber, and a substantially annular outer portion surrounding the middle portion and associated with the third chamber.

7. The method of claim 6, wherein a width of the outer portion is significantly less than a width of the middle portion.

5 8. The method of claim 7, wherein the outer portion has an outer radius approximately equal to or greater than 100 millimeters and the width of the outer portion is between about 4 and 20 millimeters.

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9. The method of claim 8, wherein the width of the outer portion of the flexible membrane is about 10 millimeters.

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10. A chemical mechanical polishing system, comprising:
a polishing pad support;
a carrier head including a flexible membrane and a plurality of independently controllable chambers, the flexible membrane having a substrate receiving surface with a plurality of portions, each chamber associated with a different one of the plurality of portions of the substrate receiving surface of the flexible membrane to control a pressure applied by an associated portion; and

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a controller configured to cause the system to
polish the substrate by holding the substrate against the polishing pad on the polishing pad support and causing the polishing pad to move relative to the substrate,

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during a first period of time of polishing, apply a common first pressure to each chamber so as to apply the same pressure at each portion of the substrate receiving surface, and

after the first period of time of polishing, reduce a pressure of at least one of the plurality of chambers while continuing to apply the first pressure to a remainder of the plurality of chambers.

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11. The system of claim 10, wherein controller is configured to halt application of positive pressure to the at least one of the plurality of chambers.

12. The system of claim 10, wherein the controller comprises software.

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13. The system of claim 10, wherein the controller is configured to, after a second period of time of polishing, reduce a pressure of the remainder of the plurality of chambers.

14. The system of claim 13, wherein the first period of time and second period of time provide uniform polishing of the substrate.

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15. The system of claim 10, wherein the plurality of portions includes an inner portion associated with a first chamber, a substantially annular middle portion surrounding the inner portion and associated with the second chamber, and a substantially annular outer portion surrounding the middle portion and associated with the third chamber.

16. The system of claim 15, wherein a width of the outer portion is significantly less than a width of the middle portion.

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17. The system of claim 16, wherein the outer portion has an outer radius approximately equal to or greater than 100 millimeters and the width of the outer portion is between about 4 and 20 millimeters.

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18. The system of claim 17, wherein the width of the outer portion of the flexible membrane is about 10 millimeters.